

Appendix B: Summary of RGD Radiation Safety Requirements

| RGD Compliance Item | Further Explanation | Class | | | |
|--|--|-------|-----|-----|-----|
| | | I | II | III | IV |
| RGD Charact/Rad. Safety Eval. | Initially and upon change | X | X | X | X |
| Inventory- unique RGD #; Class I, II: yearly; Class III, IV: every 6 months | A verbal inventory may be substituted for Class I devices | X | X | X | X |
| I. Posting | | | | | |
| Notice. Access Control | On entrances to building or area | | X | X | X |
| Caution. X-Ray Area | On doors entering rooms with RGDs | | X | X | X |
| Caution or Danger. Radiation, High, or Very High Radiation Area | Prior to entering radiation field | | X | X | X |
| Caution. RGD Approved Operating Parameters | On control console | X | X | X | X |
| Class I RGD Guidance Posting | One-page guidance posting near device | X | | | |
| Caution. RGD | On tube housing, if applicable | | X | X | X |
| Last Survey Date/Next Due sticker | On control console | X | X | X | X |
| II. Interlocks, Warning Indicators | | | | | |
| Interlocks | | | | | |
| Key controlled when not in use | Exceptions documented in safety procedure | X | X | X | X |
| Interlocks, if present are operational | | X | X | X | X |
| Enclosures of fail-safe design | | | X | X | X |
| Flash x-ray interlocked during charging | To prevent entry during charging | | X | X | |
| Emergency shutdown switch | Enclosures that can be occupied | | | (X) | X |
| Written interlock test procedures | | | X | X | X |
| Interlock bypass operations in SP | | | X | X | X |
| Master key required to access exclusion areas | | | | | X |
| Redundant interlocks on access doors to exclusion areas | | | | | X |
| Hazard-safe switches at entrances/exclusion areas | | | | | X |
| Key-lock watchman stations or Run-Safe Boxes within the exclusion area | | | | | X |
| Manual reset requirements for interlocks | | | | | X |
| Warning Indicators-Lights | | | | | |
| If warning lights are installed, do not modify | | X | | | |
| Fail-safe warning lights near source | On, when x-rays are generated or when the machine is being charged. Optional for e-beam RGDs | | X | X | (X) |
| “X-Ray On” or charging status light | Located near console | | X | X | |
| “Shutter Open” lights near shutter | “Shutter Open” lights should be present | | X | X | |
| Lights dimmed prior to operation | In large exclusion areas | | | | (X) |
| Rotating magenta lights | At entrances to “High Radiation Areas” or “Very High Radiation Areas” during operation | | (X) | (X) | X |

X denotes “applicable”; **(X)** denotes “as applicable”

| RGD Compliance Item | Description | Class | | | |
|---|--|-------|-----|-----|-----|
| | | I | II | III | IV |
| Warning Indicators-Announcements | | | | | |
| Voice announcement to vacate | Audible in large exclusion areas | | | | X |
| Warning Indicators-Alarms | | | | | |
| X-ray monitor or safety box, or equivalent fixed detector | Adjacent to port if it will enhance safety | | (X) | X | |
| RAM system with remote readout | Visible and audible alarms | | | | (X) |
| Alarms sounds with radiation generation/evacuation | Chimes/high-pitched chimes | | | | X |
| III. Shielding & Rad. Safety Survey | | | | | |
| Shielding | | | | | |
| Enclosed Beam Operations | | | | | |
| Dose rate < 0.5 mrem/h at 5 cm | Or a dose rate <100 mrem/y | X | | | |
| Dose rate < 0.5 mrem/h at 30 cm | | | X | X | |
| Shielding designed to limit dose in occupied areas to < 0.5 rem/y | | | X | X | X |
| Beams >0.1 R/h fully enclosed, if feasible | | | X | X | X |
| Beam ports covered when not in use | | | X | X | |
| Open Beam Operations | | | | | |
| Visible posted barrier at 5 mrem/h, 100 mrem/h, and >500 rads/hr | 2 mrem/hr boundary established in accessible areas | | X | X | X |
| Constant surveillance and no operator within visible barrier | | | X | X | X |
| Radiation Safety Survey | | | | | |
| “Not Operational” devices, Class I, II: yearly; Class III, IV: every 6 months | Class I devices annual radiation safety surveys may be reduced to a verbal inventory | (X) | X | X | X |
| IV. Documentation | | | | | |
| RGD logbook | Characterization, surveys, interlock test, and maintenance log. Use log for Class IV devices | (X) | X | X | X |
| Safety procedure (OSP or FSP) | Bypass operations & all Class II, III, and IV devices | | X | X | X |
| LLNL Implementation for DOE 5480.25 | Accelerators, as defined by this supplement only | | | | X |
| V. Training | | | | | |
| RGD Guidance Posting at device | | X | | | |
| HS6070 or HS6071, or equivalent | | | X | X | (X) |
| HS6911 | | | | | X |
| VI. Other Requirements | | | | | |
| Dosimetry | | | | | |
| Whole Body Dosimetry | Neutron dosimetry as required by HP | X | X | X | X |
| Extremity Dosimetry | As required by the health physicist | | (X) | (X) | (X) |
| Supplemental Dosimeters | Access to “High Radiation Areas” | | (X) | (X) | (X) |
| Portable Survey Meter | Available at work location and entrances to exclusion areas | | X | X | X |

